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Rediscovery of *Serangium montazerii* Fürsch in Georgia and updated list of the Coccinellidae of Georgia

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Abstract

This article provides an updated list of the Coccinellidae of Georgia, recording 84 species. *Serangium montazerii* Fürsch nec *S. parcesetosum* Sicard is also rehabilitated as a species actually present in the country.

Key words

beetles, Caucasus, checklist, faunistic entomology

Introduction

Merkviladze and Kvavadze (2002) provided a list that names 84 species of Coccinellidae found in Georgia. Among the species listed, *Rhyzobius lophanthae* (Blaisdell, 1892), *Novius cardinalis* (Mulsant, 1850), *Harmonia conformis* (Boisduval, 1835), and *Harmonia axyridis* (Pallas, 1773) are exotic species introduced for biological control. In the close vicinity of Georgia, Orlova-Bienkowskaja and Bieńkowski (2017) also recorded *Cryptolaemus montrouzieri* Mulsant, 1853, and *Serangium montazerii* Fürsch, 1995, which are not listed in the Georgian fauna, despite the introduction of *Serangium parcesetosum* Sicard, 1929 in the country as predator of *Dialeurodes citri* (Ashmead, 1885) during the seventies (Timofeyeva and Hoang Duc Nhuan 1978).

Here we propose an updated list of the Coccinellidae found in Georgia, taking into account the actual phylogeny and nomenclature. We also report the rediscovery of *Serangium montazerii* Fürsch, 1995 *nec Serangium parcesetosum* Sicard, 1929 in an orange grove near Batumi, and make address nomenclatural confusion about the species in Georgia.

Material and methods

Site description

The sampled site is located at Chakvis Tskali, Kobuleti District, Adjara (41.71843°N, 41.73841°E) in a familial orange grove and garden. Further orange trees located 6 km eastward along the Chakvistskali River were also sampled. Observations were conducted on 25-VI-2019.

The climate of the region is characteristic of the Batumi area and the Black Sea Georgian coast, with high precipitations (avg. 2515 mm/year), mild winters (avg. 7 °C in January) and mild summers (avg. 23 °C in July). The region has warm temperate, almost subtropical, climate conditions (Bohn et al. 2000–2003). The vegetation is represented by hygrophilous thermophytic mixed deciduous broadleaved

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forest (Bohn et al. 2000–2003). The presence of many citrus orchards, with their specific pests, have made Batumi a focus of biocontrol attempts, with release of exotic Coccinellidae during the Soviet period (Timofeyeva and Hoang Duc Nhuan 1978).

Sampling method

Beating trays were used to collect ladybird beetles by beating and shaking the branches of orange trees. The ladybird beetles were then collected with an aspirator and subsequently identified to species level in the laboratory using available literature (Gourreau 1974, Iablokoff-Knzorian 1978, Poorani 1998, Bieńkowski 2018, 2020).

Systematics

The list of the species recorded from Georgia is established following Kovář (2007), Seago et al. (2011), Escalona and Slipinski (2012), Che et al. (2017, 2021) and Zhang et al. (2018) for supra-generic levels; Tomaszewska and Szawaryn (2016): genus *Chnootriba*; Pang et al. (2020): genus *Novius*; Szawaryn and Tomaszewska (2020): genus *Rhyzobius*; Nattier et al. (2021) and Tomaszewska et al. (2021): genera *Anisocalvia* and *Hippodamia*.

Results and discussion

Serangium montazerii on *Citrus* sp.

This non-native species intentionally introduced in Georgia (Adjara) was initially identified as *Serangium parcesetosum* Sicard, 1929 (Timofeyeva and Hoang Duc Nhuan, 1978). These authors also reassigned it to its original genus after the transfer to the genus *Catana* by Chapin (1940). They were followed by latter authors and by Escalona and Slipinski (2012).

However, Fürsch (1995) described a new species, *Serangium montazerii* Fürsch, 1995 from Iranian specimens (Mazandran Province). Subsequently Duverger (1998) assigned all the introduced populations of *Serangium* in Western Europe, which were resulting from the first one introduced by Timofeyeva and Hoang Duc Nhuan (1978), to this latter species. However, after examination of specimens from Corsica, Coutanceau (2006), and Coutanceau and Malausa (2014) assigned the French introduced populations to *S. parcesetosum*. Their works, published in French in an amateurs' journal, remained largely unknown. Escalona and Slipinski (2012) in their revision of the Microweiseinae subfamily did not examine any members of the two taxa. The specimens introduced in France (continental and Corsica, Malausa et al. (1988)), and in Turkey (Yigit and Canhilal 2005)) came from this Georgian source (Timofeyeva and Hoang Duc Nhuan 1978). Likewise, neither Fürsch (1995), nor Duverger (1998), nor Coutanceau (2006) examined or compared the two taxa. However, Poorani (1998) noted that the two species can be distinguished by the shape of the right paramere and by the inter-ocular distance. Bieńkowski (2020) also underlined the same diagnostic characters and revised illustrations of the genitalia of both taxa. Moreover, the population introduced in Georgia in the 1970's (Timofeyeva and Hoang Duc Nhuan 1978) came from North India (Raniket, Uttarakhand) where *S. montazerii* occurs, while *S. parcesetosum* is distributed into Central and Southern India (Poorani 1998).

We found one specimen of *S. montazerii* on orange trees (Figure 1). It was female and we could not perform a determination using genitalia. However, the shape of the head with an inter-ocular distance equal to twice the size of the eyes (Figure 1B) allows us to assign this specimen to *S. montazerii*. The location is close to Batumi, and corresponds to the area of first historical introduction of the species in Georgia, the country of first use of the species for biological control of *D. citri* (Timofeyeva and Hoang Duc Nhuan 1978). According to Yigit and Canhilal (2005), the species was still present in Georgia in 1990. It has probably been present in the country since 1975, but was not listed by Merkviladze and Kvavadze (2002). The species is also present northward in the vicinity of Sochi (Orlova-Bienkowskaja and Bieńkowski 2017; Bieńkowski

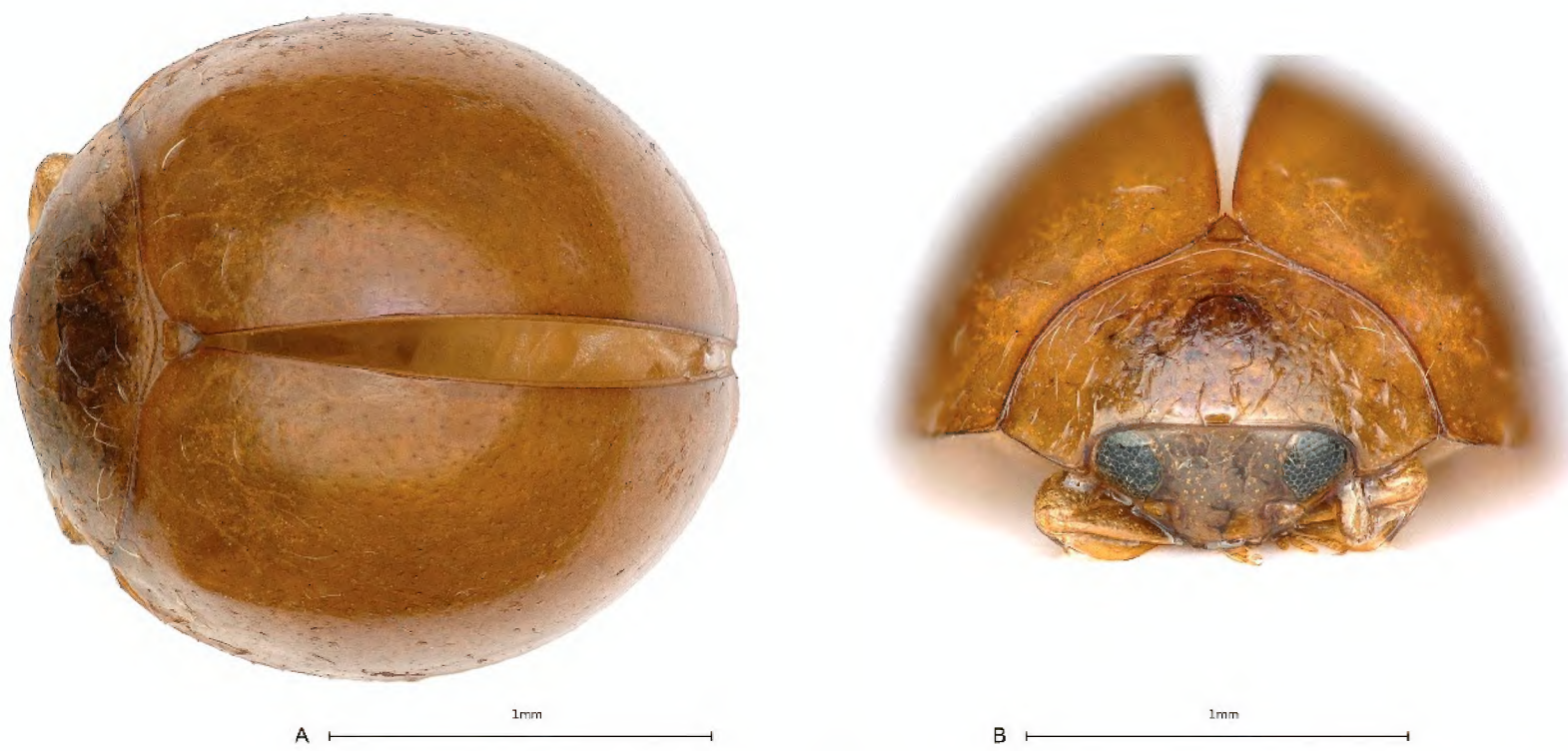

Figure 1. *Serangium montazerii* Fürsch, 1995, collected at Chakvis Tskali, 25-VI-2019 on an orange tree. **A**: dorsal view; **B** front view of the head, showing the inter-ocular distance close to 2× eye diameter. Pictures from CBGP – Continental Arthropod Collection (2021).

2018, 2020; Bieńkowski and Orlova-Bienkowskaja 2020) in Russia.

Other species found on *Citrus* sp.

Along with *S. montazerii*, we found many *Harmonia axyridis* (Pallas, 1773) both *succinea* and *axyridis* forms, *Novius cardinalis* (Mulsant, 1850), *Rhyzobius lophanthae* (Blaisdell, 1892). All of these species are introduced. Among the native species, we found *Hyperaspis campestris* Herbst, 1793, *Scymnus haemorrhoidalis* Herbst, 1797, *Scymnus subvillosus* (Goeze, 1777), *Scymnus interruptus* (Goeze, 1777), *Scymnus rubromaculatus* (Goeze, 1777) and *Nephus quadrimaculatus* (Herbst, 1783).

In addition, we report one observation of *Hippodamia undecimnotata* (Schneider, 1792) in Chalaubani (Kakheti, Gurjaani, 41.6291°N, 45.7946°E) 21-VI-2019 on Carduaceae, a new district and a new province not recorded in Merkviladze and Kvavadze (2002).

List of the species of Georgia

When a taxon's nomenclature has been changed since the publication of Merkviladze and Kvavadze (2002), the original indication is reported. Many species were not listed by Kovář (2007) in the Catalogue of Palearctic Coleoptera. We add some indications for these species. The list is in alphabetical order. The supra generic classification follows Che et al. (2021).

Family Coccinellidae Latreille, 1807
Subfamily Coccinellinae Latreille, 1807
Tribe Chilochorini Mulsant, 1846

- Six species are recorded from Georgia.

Chilocorus bipustulatus (Linnaeus, 1758)
Chilocorus renipustulatus (Scriba, 1790)
Exochomus octosignatus (Gebler, 1830)
Brumus octosignatus Gebler, 1830

- This species is not recorded in Georgia by Kovář (2007).

Exochomus quadripustulatus (Linnaeus, 1758)
Exochomus undulatus Weise, 1878
Parexochomus nigromaculatus (Goeze, 1777)
Exochomus nigromaculatus Goeze, 1777

Tribe Coccidulini Mulsant, 1846

- Three species can be considered as present in Georgia.

Coccidula rufa (Herbst, 1783)
Coccidula scutellata (Herbst, 1783)
Rhyzobius lophanthae (Blaisdell, 1892)
Lindorus lophanthae (Blaisdell, 1892)

- *R. lophanthae* is an introduced species established in a large number of countries in Europe and around the World (Roy and Migeon, 2010, Rondoni et al., 2020).

Tribe Coccinellini Latreille, 1807

- Thirty-six species are recorder from Georgia.

Adalia bipunctata (Linnaeus, 1758)
Adalia decempunctata (Linnaeus, 1758)
Anatis ocellata (Linnaeus, 1758)

- This species is not recorded in Georgia by Kovář (2007).

Anisocalvia quatuordecimguttata (Linnaeus, 1758)
Calvia quatuordecimguttata Linnaeus, 1758
Calvia rosti Weise, 1871

- Following Kovář (2007) *C. quatuordecimguttata* and *C. rosti* are synonyms.

Anisocalvia quindecimguttata (Fabricius, 1777)

- This species is not recorded in Georgia by Kovář (2007).

Anisosticta novemdecimpunctata (Linnaeus, 1758)

- This species is not recorded in Georgia by Kovář (2007).

Aphidecta obliterata (Linnaeus, 1758)
Bulaea lichatschovii (Hummel, 1827)
Calvia decemguttata (Linnaeus, 1767)
Coccinella hieroglyphica Linnaeus, 1758

- This species is not recorded in Georgia by Kovář (2007).

Coccinella magnifica Redtenbacher, 1847
Coccinella divaricata Olivier, 1808

- Following Kovář (2007) *C. magnifica* and *C. divaricata* are synonyms.

Coccinella quinquepunctata Linnaeus, 1758
Coccinella septempunctata Linnaeus, 1758
Coccinula quatuordecimpustulata (Linnaeus, 1758)
Coccinula sinuatomarginata (Faldermann, 1837)
Halyzia sedecimguttata (Linnaeus, 1758)
Harmonia axyridis (Pallas, 1773)

- This species is not recorded in Georgia by Kovář (2007). *Harmonia axyridis* has been introduced in 1927 (Iablokoff-Khnzorian 1982), but wasn't observed until 2002 (Merkviladze and Kvavadze 2002) in Eastern Georgia (Lagodekhy Reserve). Genetic studies would be necessary to assess the origin of the actual population(s), perhaps resulting of spreading from the admixed Western-Europe population (Lombaert et al. 2011).

Harmonia conformis (Boisduval, 1835)

- This species is not recorded in Georgia by Kovář (2007). *Harmonia conformis* is an introduced species (Iablokoff-Khnzorian 1982, 1983), also established in France (Coutanceau 2009) and Egypt (Iablokoff-Khnzorian 1982) against the psyllid *Aiziza uncatoides*. Its establishment has been confirmed in 2002 (Merkviladze and Kvavadze 2002).

Harmonia quadripunctata (Pontippidan, 1763)
Hippodamia apicalis (Weise, 1879)
Semiadalia apicalis (Weise, 1879)
Hippodamia notata (Laicharting, 1781)
Semiadalia notata Laicharting, 1781

- This species is not recorded in Georgia by Kovář (2007).

Hippodamia schneideri (Weise, 1878)
Semiadalia schneideri (Weise, 1878)
Hippodamia tredecimpunctata (Linnaeus, 1758)

- This species is not recorded in Georgia by Kovář (2007).

Hippodamia undecimnotata (Schneider, 1792)
Semiadalia undecimnotata Schneider, 1792
Hippodamia variegata (Goeze, 1777)
Myrrha octodecimguttata (Linnaeus, 1758)
Oenopia conglobata (Linnaeus, 1758)
Synharmonia conglobata Linnaeus, 1758
Oenopia impustulata (Linnaeus, 1758)
Synharmonia impustulata Linnaeus, 1758

Oenopia lyncea (Olivier, 1808)
Synharmonia lyncea Olivier, 1808
- This species is not recorded in Georgia by Kovář (2007).

Oenopia oncina (Olivier, 1808)
Propylea quatuordecimpunctata (Linnaeus, 1758)
Psyllobora vigintiduopunctata (Linnaeus, 1758)
Thea vigintiduopunctata Linnaeus, 1758
Sospita oblongoguttata (Linnaeus, 1758)
Neomysia oblongoguttata Linnaeus, 1758
- This species is not recorded in Georgia by Kovář (2007).

Sospita vigintiguttata (Linnaeus, 1758)
- This species is not recorded in Georgia by Kovář (2007).

Tytthaspis sedecimpunctata (Linnaeus, 1758)
- This species is not recorded in Georgia by Kovář (2007).

Vibidia duodecimguttata (Poda, 1761)

Tribe Diomini Gordon, 1999
- One species is recorded from Georgia.

Diomus rubidus (Motschulsky, 1837)
Scymnus (*Diomus*) *rubidus* Motschulsky, 1837
- This species is not recorded in Georgia by Kovář (2007). However, it is also present in Daghestan (Bieńkowski 2018) from where it was described by Motchulsky (1837).

Tribe Epilachnini Mulsant, 1846
- Three species are recorded from Georgia.

Chnootriba argus (Geoffroy, 1785)
Epilachna argus (Geoffroy, 1785)
- This species is not recorded in Georgia by Kovář (2007).

Chnootriba elaterii (Rossi, 1794)
Epilachna chrysomelina Fabricius, 1775
- This species is not recorded in Georgia by Kovář (2007).

Subcoccinella vigintiquatuorpunctata (Linnaeus, 1758)

Tribe Hyperaspidini Mulsant, 1846
- Five species are recorded from Georgia.

Hyperaspis campestris (Herbst, 1793)
Hyperaspis reppensis (Herbst, 1793)
Hyperaspis femorata (Motchulsky, 1783)
- This species is not recorded in Georgia by Kovář (2007) but in Azerbaijan and Armenia.

Hyperaspis transversoguttata Weise, 1878
- This species is not recorded in Georgia by Kovář (2007) but in Armenia.

Hyperaspis erythrocephala (Fabricius, 1787)
Oxynychus erythrocephala (Fabricius, 1787)

Tribe Noviini Mulsant, 1846
- One species is recorded from Georgia.

Novius cardinalis (Mulsant, 1850)
Rodolia cardinalis (Mulsant, 1850)
- This species is not recorded in Georgia by Kovář (2007). *Novius cardinalis* is an introduced species now present in many countries and considered as the most effective among the ladybird beetles released (Rondoni et al. 2020), consuming the scale insect *Icerya purchasi*.

Tribe Platynaspini Mulsant, 1846
- One species is recorded from Georgia.

Platynaspis luteorubra (Goeze, 1777)

Tribe Scymnini Mulsant, 1846
- Twenty species can be considered as present in Georgia.

Clitostethus arcuatus (Rossi, 1794)
Nephus (*Bipunctatus*) *bipunctatus* (Kugelann, 1794)
Scymnus (*Nephus*) *bipunctatus* Kugelann, 1794
- This species is not recorded in Georgia by Kovář (2007).

Nephus (*Nephus*) *quadrimaculatus* (Herbst, 1783)
Scymnus (*Nephus*) *quadrimaculatus* Herbst, 1783
- This species is not recorded in Georgia by Kovář (2007).

Nephus (*Nephus*) *redtenbacheri* Mulsant, 1846
Scymnus (*Nephus*) *redtenbacheri* Mulsant, 1846
- This species is not recorded in Georgia by Kovář (2007).

Scymniscus biflammulatus (Motchulsky, 1837)
- This species is not recorded by Merkviladze and Kvavadze (2002). However, it has been described from Georgia, with no more indication of location. Its status needs to be investigated.

Scymniscus biguttatus (Mulsant, 1850)
Scymnus (*Scymnus*) *biguttatus* Mulsant, 1850
- This species is not recorded in Georgia by Kovář (2007). It was first reported in the original description of Scymnus *bipustulatus* Motchulsky, 1837 from Chirvan, now in Azerbaijan. Schneider and Leder (1878) report it under the name of *S. bipustulatus* Motchulsky, from Borjomi (Samtskhe-Javakheti) and Savenko (1953) under the name of *S.* (*Sidis*) *biguttatus* Mulsant from Tbilisi.

Scymnus (*Neopullus*) *haemorrhoidalis* Herbst, 1797
Scymnus (*Neopullus*) *limbatus* Stephens, 1832
Scymnus (*Pullus*) *testaceus* (Motschulsky, 1837)
- This species is not recorded in Georgia by Kovář (2007). Scymnus testaceus has been described from The Caucasus Baths, with no more indication.

Scymnus (*Pullus*) *argutus* Mulsant, 1850
Scymnus (*Pullus*) *auritus* Westman in Thunberg, 1795
Scymnus (*Pullus*) *ferrugatus (*Moll, 1785)
- This species is not recorded in Georgia by Kovář (2007).

Scymnus (*Pullus*) *fraxini* Mulsant, 1850
Scymnus (*Pullus*) *subvillosus* (Goeze, 1777)
Scymnus (*Scymnus*) *apetzi* Mulsant, 1846
Scymnus (*Scymnus*) *frontalis* (Fabricius, 1787)
Scymnus (*Scymnus*) *interruptus* (Goeze, 1777)
Scymnus (*Scymnus*) *magnomaculatus* Fürsch, 1958
Scymnus (*Scymnus*) *quadriguttatus* Capra, 1921
- This species is not recorded in Georgia by Kovář (2007).

Scymnus (*Scymnus*) *marginalis* (Rossi, 1794)
Scymnus (*Scymnus*) *nigrinus* Kugelann, 1794
- This species is not recorded in Georgia by Kovář (2007).

Scymnus (*Scymnus*) *rubromaculatus* (Goeze, 1777)
- This species is not recorded in Georgia by Kovář (2007).

Tribe Stethorini Dobzhansky, 1924
- Two species recorded from Georgia.

Stethorus gilvifrons (Mulsant, 1850)
Scymnus (*Scymnus*) *gilvifrons* Mulsant, 1850
- This species is not recorded in Georgia by Kovář (2007).

Stethorus pusillus (Herbst, 1797)
Stethorus punctillum Weise, 1891

Tribe Sticholotidini Mulsant, 1846
- Two species are recorded from Georgia.

Pharoscymnus armenus Iablokoff-Khnzorian, 1970
- This species is not recorded in Georgia by Kovář (2007).

Pharoscymnus smirnovi Dobzhanskiy, 1927

Tribe Tetrabrachini Kapur, 1948
- Three species are recorded from Georgia.

Tetrabrachys caucasicus (Weise, 1878)
Lithophilus caucasicus Weise, 1878
Tetrabrachys connatus (Creutzer in Panzer, 1796)
Lithophilus connatus Panzer, 1796
- This species is only recorded by Kovář (2007) in central Europe, ranging from Austria to Ukraine and from Montenegro to Bulgaria. The Georgian records were reported by Scheinder and Leder (1878) in Lailasch (Racha-Leckhumi and Kveno-Svaneti), by Savenko (1953) in Kutaisi (Imereti). Iablokoff-Knzorian (1983) only cites the Caucasus region. Specific investigations are necessary to confirm/infirm its presence in Georgia.

Tetrabrachys weisei Reitter, 1880
Lithophilus weisei Reitter, 1880

Subfamily Microweiseinae Leng, 1920
Tribe Serangiini Pope, 1962
- Only one (introduced) species is recorded from Georgia.

Serangium montazerii, Fürsch, 1995

Conclusion

The Georgian fauna of Coccinellidae is containing 84 species. Two species (*S. biflammulatus* and *S. montazerii*) have been added to the Merkviladze and Kvavadze (2002) list, but one species is dubious for the country *(T. conatus*); a further two species are now considered as synonyms. Thirty species were not listed in the Catalogue of Palearctic Coleoptera (Kovář 2007).

Potential species to be sought

Among the biocontrol agents introduced into Georgia, *Cryptolaemus montrouzieri* Mulsant, 1853 is an important predator of mealybugs. The species is reported from Sochi (Orlova-Bienkowskaja and Bieńkowski 2017) in high numbers (Orlova-Bienkowskaja et al. 2018) and could be still present in Georgia. Eight other species, released between 1935 and 1990, have not been reported since their introduction in Georgia, nor along the Russian Black Sea Caucasus coast (Bieńkowski and Orlova-Bienkowskaja 2020).

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დასკვნა

საქართველოს ჭიამაიების (*Coccinellidae*) ფაუნა 84 სახეობით არის წარმოდგენილი. მერკვილაძე, ყვავაძის (2002) სახეობების სიას დაემატა ორი სახეობა (*S. biflammulatus* and *S. montazerii*), მაგრამ ჩეკლისტში შეტანილი ერთი სახეობის (*T. connatus*) არსებობა ქვეყნის ტერიტორიაზე საეჭვოა; ორი სახეობა გადაყვანილია სინონიმში. ნაშრომში წარმოდგენილი 30 სახეობა არ არის რეგისტრირებული პალეარქტიკის ხეშეშფრთიანთა კატალოგში (Kovář 2007).

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